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The Recent and fossil Tympanophorinae (Tettigoniidae, Saltatoria).
By Friedrich Zeuner, Ph.D. . . . pp. 287–302, pls. 1–2

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THE RECENT AND FOSSIL TYMPANOPHORINAE (TETTIGONIIDAE, SALTATORIA)

By Friedrich E. Zeuner, Ph.D.

Communicated by Dr. A. D. Imms, F.R.S.

[Read 3rd June, 1936.]

With Plates 1 and 2.

The following revision of the Tympanophorinae is tentative only. Many undiscovered species doubtless still exist in the forests of the Malayan archipelago and of Australia. Up to the present, 8 Recent species have been described, and in no species are both sexes known with certainty. Most of the species are based on unique specimens.

Strangely enough, this evidently little-known Recent subfamily is represented in the fauna of the Lower Oligocene amber of East Prussia. About one half of the Saltatoria of this locality are Tympanophorinae (though mostly small larvae only), among which I have distinguished the two species described below.

In addition to these two new fossil species I found, in the collection of the British Museum (Natural History), two new Recent species, and the hitherto undescribed sexes of two other species. Thus, this paper contains 6 new descriptions out of a group of not more than 12 species.

This clearly shows that our knowledge of the Tympanophorinae is far from complete. The reason is that the species lead a very concealed life in dense forests so that it is difficult to obtain specimens. One species (*Mortoniellus chopardi* sp. n.) whose body is about 20 mm. long, has antennae of 95 mm., certainly an effective safeguard against approaching enemies. Karny, who observed Tympanophorines on his expeditions, says that the insects always live in dense, shadowy places in virgin forest on shrubs, sitting on twigs. As soon as one attempts to seize them they jump for safety and mostly escape the eye at once in the dense foliage (Karny, 1924).

However, the same reason which accounts for the scarcity of Recent finds, also explains the comparative frequency of Tympanophorinae in amber, since the latter was deposited in a forest. Accordingly, the amber fauna consists mainly of forest forms.

The geographical distribution of the Tympanophorinae is remarkable. They have been found in east Australia, west Australia, Celebes, Sumatra, and the Malay Peninsula, and probably inhabit the forests of that area almost continuously. This Recent distribution would suggest that the Tympanophorinae are, and always have been, a Malayo–Australian group. The presence in a fossil European fauna of specialised members of the subfamily shows that it has not always been so, and how essential it is to consider palaeontological material when dealing with zoogeographical questions.

The following genera and species are known :—

Tympanophora pellucida White, male, female.
T. uvarovi sp. n., male, ? female.
Eomortoniellus handlirschi sp. n., male, ? female.
Mortoniellus digitatus Karny, male.

M. hamatus Karny, male.
M. karnyi Griffini, male, female.
M. chopardi sp. n., female.
Lipotactes alienus Brunn. v. W., female.
L. martynovi sp. n., male last instar.
L. maculatus Hebard, female.
L. vittifemur Karny, female.
L. azuriventer Karny, male last instar.

Tympanophora White.

1841. *Tympanophora* White, *in* Grey, *J. 2 Exped. Austr.*, **2** : 468.
1906. Kirby, *Syn. Cat. Orth.*, **2** : 229.
1912. Caudell, *Gen. Insect.*, **138** : 11.

Diagnosis. Males fully winged. Pronotum expanded backwards. Females wingless, ovipositor longer than hind femora, and almost straight.

Distribution. Australian Continent.
Genotype. Tympanophora pellucida White, 1841.

Revised description. Vertex rounded, somewhat swollen. Eyes prominent, ovate. Three ocelli which are connected by a fork-like system of ridges. Antennae long and slender, inserted between the eyes. Front broad, short, and flat. Face of triangular shape in the male, but in the female broadest at the basis of the clypeus. *Pronotum* of male a little constricted anteriorly, principal transverse sulcus situated before the middle. Posterior portion broadened and elevated, extended backwards. Hind margin rounded. No longitudinal keels. Pronotum of female short, not elevated, semicylindrical, with two distinct sulci. Truncal stigma of prothorax in front of femoral one. *Elytra* broadly ovate, venation similar to *Hexacentrus*. Musical organ comparatively large, forming a well separated part of the wing. Regular, straight cross-veins. Hind-wings smaller than the elytra, but of a similar shape. No traces of wings in the female. *Fore legs* small but stout. Coxae with spine, femora short and stout, tibiae broadened below by means of two ridges armed with heavy spines (5 proximally, 6 distally). No spines on the upper side of the fore tibia. Tympanum covered, opening rimate. Middle legs much smaller than fore legs, femora proximally below with four spines. Middle tibiae armed as fore ones below, but above with two additional spines near the distal end. Hind legs slender, not very long. Hind femora with two rows of black spines below. Genicular lobes blunt. Very small spines along the upper margins of the tibia, terminal spurs small, missing above on the inner side. Tarsi of all legs four-segmented. Metatarsal pulvilli of the fore and middle legs nearly fused into a large adhesive cushion. Hind metatarsus with one very small pair of movable plantulae, and one pair of normal pulvilli.

Tympanophora pellucida White.

1841. White, *in* Grey, *J. 2 Exp. Austr.*, **2** : 468, fig. 5.
1893. Brunner, *Ann. Mus. civ. Stor. nat. Genova*, **33** : 182.
1906. Kirby, *Syn. Cat. Orth.*, **2** : 299.
1912. Caudell, *Gen. Insect.*, **138** : 11, pl. 1, fig. 1.
1921. Karny, *Treubia*, **1** : 192, fig.
1924. Karny, *Treubia*, **5** : 160.

Diagnosis. ♂. Fore-wings about 1·5 times as long as hind femora. Cerci with one large and two small teeth on the tip. Femoral stigma slot-like, more than three times as high as wide.

♀. Entirely wingless. Middle femora thickened. Ovipositor longer than the outstretched hind legs, nearly straight, but very slightly curved downwards. Femoral stigma broadly open, not covered by the pronotum.

Distribution. S.W. Australia. Type locality King George's Sound.

Type. ♂, Nr. 506, Brit. Mus. (Nat. Hist.).

Material. Two further males from the type locality, and two males from "W. Australia" (*G. C. Shortridge*) 1906, Brit. Mus. coll.

♀, plesiotype, from type locality, one female larva from the same place, and one female larva (last instar) from "New Holland" "Biwerbank," a locality unknown to me. All these specimens in the Brit. Mus. collection. The two females from the type locality were collected, together with the male holotype, by Capt. Grey 1837–1839.

Description and remarks. The male is reminiscent of species of *Hexacentrus*, the principal differences being the stouter stature of *Tympanophora*, its swollen vertex and its swollen and elevated hind portion of pronotum. The fore tibiae are not broadened in *Hexacentrus* as they are in *Tympanophora*. The stridulating organ of *Tympanophora* is comparatively larger than in *Hexacentrus*, but the venation is similar in many respects. The main arrangement of the veins is the same. *Tympanophora* is more highly specialised in having the *M* of the elytron forming a concave arch towards the hind margin, and in having a regular system of cross-veins. The hind-wings of *Hexacentrus* have approximately the same size as the fore ones; in *Tympanophora* they are smaller. These features of *Tympanophora* indicate a higher specialisation. It may be added that *Hexacentrus* has 2 or more external spines on the middle tibia from which may be derived those preserved in *Tympanophora* as well as the one frequently found in *Lipotactes* and *Mortoniellus*. The upper terminal spur of the inner side, which is present in *Hexacentrus*, is missing in *Tympanophora*. The cerci of *Tympanophora*, however, are less specialised than those of *Hexacentrus*. They are fairly stout, cylindrical, tapering only near the end, where they are slightly curved. In *T. pellucida*, the principal tip bears *two* very small teeth. In addition, the normal inner tooth has moved down to the apex. Since it is larger than the other two, it is more easily observed. *T. pellucida* is well distinguished from *T. uvarovi* in the dentils of the cerci.

The five males of *T. pellucida* which I studied show few individual differences. Those present in the wings may be found in the table given below in which the shapes of the elytra in the two species of *Tympanophora* are compared. The measurements of the types of *T. pellucida* and of *T. uvarovi* are:

	T. pellucida.	*T. uvarovi.*
long. corporis (contract.) . .	14 mm.	26 mm. (*not* contr.)
lat. capitis (cum oculis) . .	4·2 „	5·1 „
long. pronoti	3·9 „	5·0 „
max. lat. pronoti . . .	4·8 „	5·1 „
long. fem. ant. . . .	4·0 „	4·8 „
long. fem. med. . . .	3·1 „	4·1 „
long. fem. post. . . .	12·7 „	14·7 „
long. elytrorum . . .	20·8 „	29·0 „

The female of *Tympanophora pellucida* is very different from the male. Head broader than pronotum. Pronotum short, as long as broad, semicylindrical, with two distinct sulci. Legs as in the male sex, but middle femora more distinctly swollen. No traces of wings. Subgenital plate semicircular. Ovipositor longer than body, almost straight, very slightly curved downwards.

The pronotum being semicylindrical, it is very different from that of the males, and rather reminiscent of the females of *Lipotactes* and *Mortoniellus*. The females of *Tympanophora* are distinguished from the latter by their slender

appearance, and the long and straight ovipositor which is short and curved upwards in *Lipotactes* and *Mortoniellus*.

Measurements of typical female :—

long. corporis (*not* contract.)	19·9 mm.
lat. capitis	4·5 ,,
long. pronoti	3·1 ,,
lat. pronoti	3·7 ,,
long. fem. ant.	4·6 ,,
long. fem. med.	3·7 ,,
long. fem. post.	12·0 ,,
long. tib. post.	11·5 ,,
long. ovipositoris	26·6 ,,

Tympanophora uvarovi sp. n.

Diagnosis. ♂. Fore-wing about twice as long as hind femur. Cercus with one large and one small tooth near the tip. Femoral stigma broadly oval, less than three times as high as wide. (Pl. 2, fig. 6.)

♀. ? Very similar to *T. pellucida*, but femoral stigma concealed under the pronotum. (Pl. 2, figs. 7, 8.)

Distribution. East Australia.

Type. ♂, Brit. Mus. (Nat. Hist.).

Material. Male paratype, in the same collection. Both specimens come from " between Sidney and Moreton Bay " (*Mr. Strutchbury*).

One female probably belongs to this species. It was taken either at Melbourne, Launceton, or Sydney, by Mrs. Marsden. In any case, it comes from the south-eastern portion of the continent.

Description and remarks. Male very similar to *T. pellucida*. A little larger, wings longer. Hind portion of pronotum more distinctly swollen, a relative yet a good character. There are also differences in the subgenital plate, but the specimens are not well enough preserved to allow a description.

By far the best discriminating character is found in the cerci. They are stout, cylindrical, with the apex a little bent inwards, and thus similar to those of *T. pellucida*, but there is only *one* small tooth on the tip of the cercus, in addition to the normal inner tooth.

The measurements of the type specimen were given above together with those of *T. pellucida*.

The species is dedicated to Dr. B. P. Uvarov, the eminent Orthopterist.

It is very unfortunate that the female mentioned above is not from the same locality as the males. Morphologically, it is so similar to the females of *T. pellucida* that I attributed it to the latter species until I discovered that its femoral stigma is concealed under the pronotum. This is evidently a good specific character, and it is, therefore, most desirable that more material be obtained in order to settle the question whether this kind of female belongs to *T. uvarovi* or whether it represents a third species.

The two species *pellucida* and *uvarovi* are closely allied to one another, yet they can easily be separated not only by the characters enumerated above, but also by the size and proportions of their wings.

The fore-wings are distinctly shorter in *pellucida* than in *uvarovi*. This is easily expressed in figures by comparing the length of the elytron with the length of the hind femur, as shown in the following table :—

Length of elytron in relation to length of hind femur :—

T. pellucida (1) 22·0 : 14·8 = 1·49
(2) 21·6 : 13·6 = 1·59
(3) 20·1 : 13·0 = 1·55
(4) 20·8 : 12·8 = 1·62 (Type)
(5) 22·0 : 13·5 = 1·63

T. uvarovi (1) 29·0 : 14·8 = 1·96 (Type)
(2) 28·0 : 13·9 = 2·01

There results an index of about 1·5–1·6 for *pellucida*, and one of 2·0 for *uvarovi*.

The proportions of the fore-wings also are different in the two species as is shown by the ratio length : maximal width, in the following table :—

Length of elytron in relation to its width :—

T. pellucida (1) 22·0 : 9·1 = 2·42
(2) 21·6 : 8·8 = 2·45
(3) 20·1 : 9·0 = 2·24

T. uvarovi (1) 29·0 : 10·7 = 2·71 (Type)
(2) 28·0 : 10·5 = 2·66

The fore-wings of *uvarovi* are obviously more slender than are those of *pellucida*.

Eomortoniellus gen. n.

Diagnosis. Similar to Recent *Mortoniellus*, but pronotum smaller, in the male sex not covering the stridulating organ. Male cerci of the *Tympanophora* type.

Distribution. Lower Oligocene amber of East Prussia.
Genotype. Eomortoniellus handlirschi sp. n.

Description and remarks. Before I discovered an adult male specimen in the collection of the British Museum, I had studied already a fair number of small Tettigoniid larvae and come to the conclusion that about one half of them belonged to the subfamily Tympanophorinae. Later, I found that the different instars of this particular new species are not rare in Prussian amber.

The detailed description of the new genus is included within the description of the genotype.

Eomortoniellus handlirschi sp. n.

1856. *Locustina* (Larva) E. F. Germar, *in* Berendt, *Bernstein befindl. organ. Reste Vorwelt*, 1 : 32 (partim); pl. 4, fig. 7 B.

Diagnosis. Smaller and less robust than any Recent *Mortoniellus*. Length of body *ca.* 10·5 mm., hind femur *ca.* 7 mm. (Pl. 1, figs. 1, 2, 3.)

Distribution. Lower Oligocene amber, East Prussia, Germany.
Type. Holotype In 29119, Brit. Mus. (Dept. of Geology). Particulars and paratypes see following paragraph.
Material. Three specimens are preserved in the British Museum (Natural History). In addition to these, I have studied 7 specimens belonging to foreign collections.
In 29119, Brit. Mus. (Dept. of Geology). Presented by A. Théry, ii.1932. Adult ♂. (Type.)
O.1, Geol. Institute Univ. Berlin, Coll. Simon. Large ♂ larva. **G.I.B.K. 1,** Geol. Institute Univ. Berlin, Coll. Kühl. Large female larva.
Small larvae probably belonging to this species :—
In 18845, Brit. Mus. (Dept. of Geology), Klebs Coll. **O.22,** Coll. Baron v. Bachofen-Echt, Vienna. **O.6,** Coll. Baron v. Bachofen-Echt, Vienna. **Ber. 7 B,**

Geol. Institute Univ. Berlin, Coll. Berendt. Type of Germar's "Locustina Larva." **Ber. 37, No. 1,** Geol. Institute Univ. Berlin, Coll. Berendt. One of Germar's specimens. **In 29115,** Brit. Mus. (Dept. of Geology). Presented by A. Théry, ii. 1932. **112,** Zool. Mus. Berlin, Coll. of Orthoptera.

Remarks. The large male larva (O.1) was referred to this species because of the shape of the cerci. The female larva (G.I.B.K. 1) is a Tympanophorine without external spine on the middle tibia, and therefore probably an *Eomortoniellus*, and certainly not a *Lipotactes martynovi*. The remaining seven larvae may belong to either of the two species. They are too small to exhibit typical characters. I have ranged them with *Eomortoniellus*, because of the absence of the external spine of the middle tibia. These small larvae which are described separately below, are not rare in amber.

The species is dedicated to the memory of the late Dr. Anton Handlirsch, Vienna, to whose work we owe the great advance of palaeo-entomology during the first quarter of this century.

Description. Adult ♂. Body 10·5 mm., hind femur about 7 mm. Head resembling *Tympanophora*, large, but not so exceedingly broad as in *Mortoniellus*. Eyes prominent, globular. Vertex very broad, its fastigium apparently less prominent than in *Lipotactes martynovi*. *Pronotum* small, saddle-shaped, its hind portion elevated and not narrowed as in *Mortoniellus*. Sulci well marked. No lateral keels, but a weak median one on the hind portion. Side lobes very short. (Pl. 1, fig. 1.) Femoral stigma of the prothorax small, almost circular, and placed almost below the truncal stigma. *Wings* reduced. Fore-wings consisting of stridulating organ only, but distinctly longer than the pronotum. Behind the mirror and near the lower margin, there is another semi-transparent spot which is also found in Recent *Mortoniellus*. All *femora* thickened in their basal portion, and covered with small tubercles from which hairs originate, but without spines below. Fore tibia anteriorly with four large spines, and two small ones near the apex. Middle tibia with the same arrangement of spines on either side (pl. 1, fig. 2). The external spine which is found not far from the basis of the middle tibia in most *Lipotactes* and *Mortoniellus*, is missing. Cross-section of hind tibiae square-shaped, spines along all four edges (pl. 1, fig. 2). Movable plantulae of hind metatarsus present. Hind knees destroyed in the specimen. *Abdomen* comparatively slender and small. Subgenital plate broad, with a broad sinus between the styli. Cerci with one large and two small terminal teeth (which are directed inwards), very similar to those of *Tympanophora pellucida*, very different from those of *Mortoniellus*. (Pl. 1, fig. 3.) *Coloration* concealed by a layer of white "emulsion" which covers almost the whole specimen.

Large male larva. The male larva of the Berlin Collection (O.1) is probably the last instar (length of body approximately 7·2 mm.). It shows most of the essential features of the adult. In particular, its pronotum is distinctly saddle-shaped. Traces of the coloration are preserved and show that the pronotum was variegated, brown, with a brighter middle stripe, and with dark side lobes. The back and the sides of the abdomen were dark, with a pale stripe separating the back from the sides. Although the cerci are partly covered with emulsion, they are evidently of the same shape as in the adult specimen, and quite different from those of *Lipotactes martynovi*. Both hind legs are missing.

Large female larva. I am not quite certain that I am correct in referring this larva to *Eomortoniellus handlirschi*. It agrees with the type specimen in having the same general shape and size, the same shape of the head, especially of the vertex, the same armament of the middle tibia, and in having the short, movable plantulae of the hind metatarsus which are so typical of TYMPANO-

PHORINAE. On the other hand, it differs in the pronotum which is almost straight above as seen from the side, further in the tubercles on the femora being very small, and finally in having only two rows of spines on the hind tibia. These differences may be partly sexual characters (pronotum, for instance), partly larval characters (spines of hind tibia, for instance). In any case, the specimen is a Tympanophorine closely allied to the *Mortoniellus*-group. The absence of the external spine of the middle tibia renders it impossible to range this specimen with *Lipotactes martynovi*.

The ovipositor is as long as pronotum and abdomen together, slightly curved upwards, and therefore intermediate between the ovipositors of *Tympanophora* and *Lipotactes–Mortoniellus*. No dentils are to be seen at the tip of the ovipositor. The genicular lobes of the hind femur are armed with a spine, as in *Lipotactes* and *Mortoniellus*.

Coloration similar to that of the large male larva described above. Lower portion of head, upper portion of hind femur, and hind knee also dark in various degrees.

Length of body *ca.* 8·3 mm., hind femur *ca.* 7 mm.

Small larvae. Some of the seven small larval specimens recorded above may belong to another species of TYMPANOPHORINAE. However, since they do not possess the external spine of the middle tibia, I have classified them with *Eomortoniellus* and not with *Lipotactes martynovi*. These small larvae were already determined by me as TYMPANOPHORINAE before I found any larger specimens.

The following description may help to segregate the small larvae of the *Eomortoniellus*-type from those of other amber species.

Length of body 5–6 mm.

Head large and considerably broader than pronotum. Eyes prominent, globular. Vertex very broad and somewhat swollen between the eyes. Antennae inserted between the eyes but, owing to the large distance of the latter, the bases of the antennae, too, are widely separated, and an area of the front broadly extends between the bases of the antennae. Mouth-parts comparatively small. *Pronotum* semicylindrical, with no keels or edges, side-lobes semicircular. Meso- and metanotum similar to pronotum, but much shorter, and partly covered by the former. *Legs* rather short, as in many Tettigoniid larvae. Fore tibia unarmed above, but with two rows each of six spines below, which form distinct ridges and cause the tibia to appear broader. Tympanum not visible, probably covered. Middle legs similar to the fore ones, without external spine on the tibia. Hind femora as long as pronotum plus abdomen, stout, bottle-shaped. Hind tibiae with two rows of very small spines above. All tarsi four-segmented, hind metatarsus with one short, movable pair of plantulae and one normal pair of pulvilli. *Cerci* cone-shaped, straight, with a slender and pointed tip.

Mortoniellus Griffini.

1909. *Mortoniellus* Griffini, *Wien. ent. Ztg.*, **28** : 107.
1912. *Mortoniellus* Griffini : Caudell, *Gen. Insect.*, **138** : 11.
1922. *Lipotactes* Brunner : Hebard, *Proc. Acad. nat. Sci. Philad.*, **74** : 267.
1924. *Mortoniellus* : Karny, *Treubia*, **5** : 161.
1931. *Mortoniellus* Griffini : Karny, *Treubia*, **12** (suppl.) : 96.

Diagnosis. Similar to *Lipotactes*, but pronotum saddle-shaped, and ovipositor with minute dentils.

Distribution. Malay Archipelago.

Genotype. Mortoniellus karnyi Griffini, 1909.

Remarks. The interrelations of *Mortoniellus* and *Lipotactes* will be treated

under the latter genus. The hitherto unknown male of *M. karnyi*, and the female of a new species, are described below. The four known species of *Mortoniellus* may be distinguished according to the following key :—

1. Mandibles yellow, only the tip black. Hind knee shining, black . . . . 2.
   Mandibles black, except a yellow spot near the base. Hind knee pale or slightly darkened . . . . . 3.
2. Male supra-anal plate triangular, small. Body about 16 mm. long. *digitatus*.
   Male supra-anal plate with two triangular lobes, large. Body about 11 mm. long . . . . . *hamatus*.
3. All femora pale, male supra-anal plate large, broad, its hind margin convex. Body about 16 mm. long. . . . . *karnyi*.
   All femora almost entirely black. (Only female known.) Body about 16 mm. . . . . *chopardi*.

The cerci of the male are very similar in the three species of which males are known. They are stout, cone-shaped, blunt (? good difference against *Lipotactes*), and provided with a double appendage on the inner side, consisting of a short, blunt process and a long, arched hook (*see* Karny 1931 : 101, figs.). There are, however, specific differences in the supra-anal and subgenital plates. The hind femora are unarmed.

Mortoniellus digitatus Karny.

1931. Karny, *Treubia*, **12** (suppl.) : 100, fig. 47.

Diagnosis. Supra-anal plate of male small, triangular, rounded. Subgenital plate with an angular excision between the styli. Body of adult male 15·5 mm. long.

Distribution. Central Celebes.

Type. ♂, Sarasin Coll., Vienna Museum of Natural History. Paratype a juvenile ♀ in the same collection.

Remarks. The species was described in detail by Karny. In size and stature very similar to *M. karnyi*. Last tergite in front of the supra-anal plate slightly insinuated. In addition to these morphological characters and those given in the diagnosis, the coloration provides an easy means of determination, the hind knee being shiningly black.

The external spine of the middle tibia is present.

Mortoniellus hamatus Karny.

1931. Karny, *Treubia*, **12** (suppl.) : 101, fig. 48.

Diagnosis. Supra-anal plate of male large, with two angular posterior lobes. Subgenital plate straight between the styli. Body of adult male 10·3 mm. long.

Distribution. North Celebes.

Type. ♂, Sarasin Coll., Vienna Museum of Natural History. Unique specimen.

Remarks. Pattern and coloration exactly as in *M. digitatus*. The last tergite in front of the supra-anal plate is not insinuated.

Mortoniellus karnyi Griffini.

1909. Griffini, *Wien. ent. Ztg.*, **28** : 108, fig.
1912. Caudell, *Gen. Insect.*, **138** : 12, pl. 1, fig. 7.

Diagnosis. Supra-anal plate of male large, trapezoidal, hind margin convex. Subgenital plate with a deep, semicircular excision between the styli. Body about 16 mm. long. Femora pale, or slightly darkened, not black. (Pl. 2, fig. 9, 10.)

Distribution. Sumatra and Malay Peninsula.

Type. ♀, from Sumatra, Museum of Natural History, Lausanne?

Material. One ♂ (plesiotype) and one ♀ from Klang Gatis, Malaya, 29.x. (♂), and 12.xi. (♀) 1933 (*N. C. E. Miller*). These specimens are now in the collection of the British Museum (Nat. Hist.).

Description. The female from Klang Gatis has a slightly lighter colour, but otherwise agrees in every detail with the description of the type. Similarly, the male from Klang Gatis agrees in all those characters which are not sexual, with the female from the same locality. Since it is easy to distinguish *M. karnyi* from the other species of the same genus, I have no doubt that the two specimens from the Malay Peninsula belong to the species in question. The type was found in Sumatra, it therefore is not surprising to meet the same species in the neighbouring Malayan Peninsula.

It is now possible to give a description of the male (pl. 2, figs. 9, 10). In size and stature very similar to *M. digitatus*. Apart from the characters mentioned in the diagnosis, there is no morphological difference between the two species. The last tergite in front of the supra-anal plate is insinuated also in *M. karnyi*. The external spine of the middle tibia is present.

The colour of the male is predominantly yellowish-green, instead of yellowish-brown in the two known females, a difference which is probably unimportant. Only the mandibles are black (with the exception of a yellow spot near the basis), and the hind margin of the pronotum. The second sulcus of the pronotum is darkened, and so are the upper sides of the fore and middle tibiae. The hind knees are darkened, *but not black*, and the same is the case with the proximal three-quarters of the hind tibiae. The extension of the back of the pronotum over the stridulating organ is a sexual character. The female pronotum is shorter than that of the male, and its hind margin is almost straight. The female is distinguished from that of the new species *M. chopardi* not only in the coloration but in the shape of the ovipositor, too. The lower margin of the latter is, in *M. karnyi*, almost straight in its basal half, but curved in *chopardi*.

It may finally be mentioned that *M. karnyi* and *M. chopardi* have 5 pairs of spines (terminal ones included) on the fore and middle tibiae.

Measurements of *M. karnyi* :—

	♂.	♀.
Long. corporis (contract.) . . .	16·1 mm.	14·3 mm.
lat. capitis cum oculis . . .	8·7 „	8·2 „
long. pronoti	7·3 „	5·3 „
long. fem. post.	18·2 „	18·1 „
long. tib. post.	16·8 „	16·4 „
long. ovipositoris		9·4 „

Mortoniellus chopardi sp. n.

Diagnosis. Knee pale, femora black except upper portion. Tarsi pale. Size as in *M. karnyi*. (Pl. 2, figs. 11, 12.)

Distribution. Rinching, Federated Malay States (*N. C. E. Miller*), 4.iii.1930.

Type. ♀, British Museum (Nat. Hist.). Unique specimen.

Remarks and description. This species has the same shape and size as *M. karnyi*. The only morphological difference is the shape of the ovipositor, the lower margin of which is curved in its basal third, then almost straight, but curved again in its apical third. In *M. karnyi* it is, according to the specimen in the Brit. Mus. collection, almost straight in the basal half, and curved in the apical half. The coloration of *M. chopardi* is very different from that of the other species. The general light brown may be due to altera-

tions *post mortem*, it may have been green originally. There are typical black designs in the following places: a small line surrounding the eyes, the zone between the eyes (including the bases of the antennae, and the fastigia), the upper margin of the clypeus, the mandibles (except a yellow spot on their bases), the hind margin of the occiput, the hind margin of the side lobes and of the back of the pronotum, the second pronotal sulcus (infuscated, not black) the lateral plates of the meso-metathorax, and all the three pairs of tibiae with the exception of a pale zone of varying extent near the knee.

Measurements of the type :—

long. corporis (contract.)	16·9 mm.
lat. capitis cum oculis	8·2 „
long. pronoti	5·5 „
long. fem. post.	17·2 „
long. tib. post.	15·8 „
long. ovipositoris	8·8 „
long. antennarum	95 „

The species is dedicated to Dr. L. Chopard of the Muséum d'Histoire Naturelle, Paris, the foremost authority on Gryllidae.

Lipotactes Brunner.

1898. Brunner, *Abh. Senckenberg. Naturf. Ges.*, **24** : 274.
1922. Hebard, *Proc. Acad. nat. Sci. Philad.*, **74** : 267.
1924. Karny, *Treubia*, **5** : 160.
1931. Karny, *Treubia*, **12** (suppl.) : 97.

Diagnosis. Wings reduced. Pronotum not saddle-shaped. Ovipositor shorter than hind femora, curved upwards, and smooth.

Distribution. Malayan peninsula, Sumatra, Borneo, fossil in the Lower Oligocene amber of Germany.

Genotype. Lipotactes alienus Brunner, 1898.

Remarks. Lipotactes is closely allied to *Eomortoniellus* and *Mortoniellus*. Hebard put *Mortoniellus* into the synonymy of *Lipotactes*, and Karny (1931) left it open to decide whether the distinguishing characters were of generic value or not. He was, however, inclined to maintain both genera in view of the differences in the pronotum and the ovipositor. All other characters are not constant as will be seen from the descriptions of the species. In the same paper Karny even suggested that all *Lipotactes* may be juvenile specimens of *Mortoniellus*. After the discovery, in the Lower Oligocene, of a fossil *Lipotactes*, and of another species more closely allied to *Mortoniellus*, I believe the separation of the two genera is justified. Fortunately, the last larval instars of both fossil forms are known. The last instar of *Mortoniellus* has already the saddle-shaped pronotum, whilst that of *Lipotactes*-larvae of the same instar is semicylindrical. Thus, it is very unlikely that the last larval stages of the Recent *Mortoniellus* should not have the saddle-shaped pronotum, but one of the *Lipotactes*-type instead.

For this reason, I maintain the genus *Lipotactes* Brunner. At present, it contains five insufficiently known species which are readily distinguished by their coloration and size. The hind femora of *Lipotactes* are unarmed as are those of *Mortoniellus*.

Lipotactes alienus Brunner v. Wattenwyl.

1898. Brunner, *Abh. Senckenberg. Naturf. Ges.*, **24** : 274, fig. 53.
1924. Karny, *Treubia*, **5** : 161.

Diagnosis. "Occiput ferrugineo et nigro lineatum. Pronotum ferrugineum, margine antico fusco limbato, disco fusco variegato. Pedes ferruginei. Femora postica apice infuscata" (Brunner). Length of body 16 mm.

Distribution. Borneo.

Type. ♀, in coll. Kükenthal, Vienna Museum of Natural History. Unique specimen.

Remarks. This species is 16 mm. long; its hind femora are 13·5 mm. long. It seems to have no external spine on the middle tibia, otherwise Brunner would have mentioned it. The fore tibiae have 5 anterior and 4 posterior spines. In its habitus, *L. alienus* resembles the fossil *L. martynovi*, and not *Mortoniellus karnyi*, yet another reason for keeping *Lipotactes* separate from *Mortoniellus*.

Lipotactes martynovi sp. n.

Diagnosis. Length of body (last larval stage), 10 mm. Pronotum and abdomen dark dorsally, also the basal portion of the pronotal side lobes. (Pl. 1, figs. 4, 5.)

Distribution. Lower Oligocene amber of East Prussia.

Type. No. 109, Coll. of amber Orthoptera, Zool. Museum, Berlin. Male larva, last instar.

Material. Apart from the type, a small male larva in the same collection, No. 111.

Remarks. I should not have named this form but for the discovery of another larva of the same ontogenetic stage clearly belonging to *Eomortoniellus*. Thus it is easy to make out the differences between the two genera.

The species is dedicated to Professor A. B. Martynov, Leningrad, the well-known Russian palaeo-entomologist.

The second larva mentioned above, is only 6 mm. long. It is the only small Tympanophorine larva from the amber known to me which is in the possession of the external spine of the middle tibia. I therefore referred it to this species, attributing the others to *Eomortoniellus*.

Description. Length of the body 10·0 mm., hind femur 9·8 mm., pronotum 2·8 mm.

Head reminiscent of *Tympanophora*. Eyes globular, vertex broad. Antennae inserted between the eyes. Fastigium verticis prominent, subsulcate, blunt. Pronotum smooth, not saddle-shaped. Its sulci indistinct, lateral lobes as large as in *Mortoniellus*. Hind margin of pronotum rounded, but almost straight. Back of pronotum with dark pattern. As seen from the side, the back of the pronotum is straight as in *Lipotactes*, not concave as in *Mortoniellus* and *Eomortoniellus*. Femoral stigma of prothorax pear-shaped, wider basally; truncal stigma a short vertical slit, in front of the former. Wings much reduced in length, fore-wings of male consisting of the stridulating organ only (visible in the type though it is a larva). Shape of the *legs* normal. Fore coxa with one spine, as in all TYMPANOPHORINAE. Fore and middle femora with a small number of bristles. Fore tibia with two rows of strong, dark spines below, the posterior row having 6 spines, the anterior one being invisible. Middle tibia similarly armed but with one external spine above near the knee. Genicular lobes of hind femur not prominent, almost blunt. Hind tibia with two rows of small spines above; its end not preserved. All femora dark on their upper sides. *Abdomen* comparatively slender, dorsally darker. Cerci (pl. 1, fig. 5) swollen in the basal half, slender in the apical one, and pointed (very similar to those of *Lipotactes azuriventer* described by Karny, 1924).

This fossil specimen exhibits all the important characters of the Recent genus *Lipotactes*. It differs from the best known Recent species of the genus

(*L. maculatus* Hebard) in having 6 instead of 5 spines on the fore tibia, in the presence of an external spine on the middle tibia, and apparently also in the globular eyes (*see* Hebard, 1922 : pl. 15).

Lipotactes maculatus Hebard.

1922. Hebard, *Proc. Acad. nat. Sci. Philad.*, **74** : 267–269, pl. 15, fig. 12.

Diagnosis. Length of body 11·2 mm., blackish band along the sides of pronotum and abdomen. Femora with numerous black spots.

Distribution. Singapore.

Type. Hebard Coll., No. 831, ♀, unique specimen.

Remarks. This species was carefully described by Hebard. It seems to differ from *L. alienus* and *martynovi* in the shape of the eyes which are, in Hebard's figure, oval, whilst as a rule they are more globular. The external spine of the middle tibia is apparently absent in *L. maculatus*. There are 5 pairs of spines on the fore tibia.

The following two species have also been referred to *Lipotactes* by Karny. Later on, however, he thought it possible that they were larval stages of some species of *Mortoniellus*.

Lipotactes vittifemur Karny.

1924. Karny, *Treubia*, **5** : 162–163.

Diagnosis. Body of female (Larva?) 9 mm. long. " Femora postica pallida, extus in dimidio basali vitta obliqua nigra ornata necnon geniculis late nigerrimis " (Karny).

Distribution. South Sumatra.

Type. ♀, Buitenzorg Museum, No. 51 (*Karny*).

Remarks. L. vittifemur is based on a female, possibly on a larva. The head is large and very broad, therefore apparently reminiscent of *Mortoniellus*. The pronotum, as seen from the side, is quite straight dorsally, not saddle-shaped. It has a dark pattern. Genicular lobes of hind femora spined. Middle tibia without external spine. " Lamina subgenitalis ♀ transversa, late rotundata, apice obtusangulatim emarginata, lobis rotundatis."

Lipotactes azuriventer Karny.

1924. *Lipotactes azuriventer* Karny, *Treubia*, **5** : 163–164.
1931. *Mortoniellus azuriventer* : Karny, *Treubia*, **12** (suppl.) : 99, fig. 46.

Diagnosis. Body of male (last instar) 10 mm. long. Pronotum only with black fore margin and infuscated first sulcus. Hind femur pale, knee broadly black.

Distribution. South Sumatra.

Type. ♂, last instar, Buitenzorg Museum, No. 44 (*Siebers*).

Remarks. In 1931, Karny compared the type of *L. azuriventer* with his newly obtained adult specimens of *Mortoniellus* males, and came to the conclusion that the type in question is a larva. He consequently referred *L. azuriventer* to *Mortoniellus*, but I prefer to retain the species within the genus *Lipotactes*, because of the pronotum which is not saddle-shaped. The pronotum of the male larva of *Eomortoniellus* having already the peculiar shape found in the adult, it is probable that the same is the case with the larvae of the closely allied genus *Mortoniellus*. *L. azuriventer*, therefore, is likely to be a real *Lipotactes*. However, more material is urgently needed in order to settle the question of the interrelations of these two genera.

Head as in *L. vittifemur*.

Middle tibia with external spine. Hind legs as in *vittifemur*, but the black stripe on the femur missing.

The genital apparatus was described by Karny in 1924, but his figure (1931) differs from the description. Since the figure is more recent, and drawn after a comparison with two males of *Mortoniellus*, I consider it as more reliable than the description. The cerci are cone-shaped in their basal portion, slender and pointed at the end. At one-third from the basis there is a short inner tooth. The cerci resemble those of *L. martynovi* although the latter have no tooth whatever. The difference against the cerci of the three known males of *Mortoniellus* is considerable. These species have thick and blunt cerci with teeth of a more or less unusual shape.

The Genera of *Tympanophorinae*.

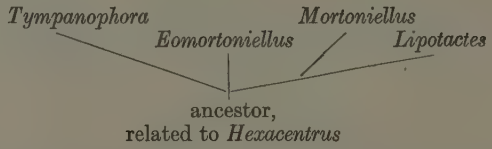
Among the known genera of Tympanophorinae, *Tympanophora* is the most original genus in so far as its males are fully winged. It is also most primitive in the normal size of the head, but otherwise it is as specialised as are the wingless genera, though in different respects. The relations of the genera are best given in the form of a table showing which are the similarities, or characters in common, of the genera. For reasons which will be understood later on, the Listrosceline genus *Hexacentrus* is added.

Head of normal size : *Tympanophora*, *Eomortoniellus*, *Lipotactes*, *Hexacentrus*.
Head large : *Mortoniellus*, ? *Lipotactes* partim.
Pronotum extended backwards : male *Tympanophora*, *Hexacentrus*.
Pronotum semicylindrical : female *Tympanophora*, *Lipotactes*.
Pronotum saddle-shaped : *Eomortoniellus*, *Mortoniellus*.
Middle legs smaller than fore legs : *Tympanophora*.
Middle tibia with one external spur basally above : *Mortoniellus*, most species of *Lipotactes*.
Middle tibia with two apical spurs above : *Tympanophora*.
Middle tibia with two or more (not apical) spurs above : *Hexacentrus*, *Listroscelis*.
Middle tibia with no spurs above : *Hexacentrus* partim, *Eomortoniellus*, ? *Lipotactes* partim.
Hind femur with spines below : *Tympanophora*, *Hexacentrus*.
Hind tibia with four rows of spines : *Eomortoniellus*, *Hexacentrus*, some small, apical spines also in *Mortoniellus*.
Male cerci of *Tympanophora*-type : *Tympanophora*, *Eomortoniellus*.
Male cerci of *Mortoniellus*-type : *Mortoniellus*.
Male cerci of *Lipotactes*-type : *Lipotactes*.
Ovipositor long and straight : *Tympanophora*, *Eomortoniellus*.
Ovipositor short and straight : *Hexacentrus*.
Ovipositor short and curved upwards : *Mortoniellus*, *Lipotactes*.
Ovipositor with dentils : *Mortoniellus*.

It is obvious from this table that none of the known genera can be called ancestral to the others. *Tympanophora*, though more primitive than the *Mortoniellus*-group in several respects, has the spines of the middle tibia, the size of the middle legs, the cerci, and the ovipositor differently specialised. *Eomortoniellus* seems to connect *Tympanophora* and *Mortoniellus*, but it is

differently specialised in having lost entirely the external spines of the middle tibia, and in having four rows of spines on the hind tibia.

The former feature is not significant since a single spine may easily become reduced (as for instance also in *Lipotactes*). The latter character, however, *is* primitive. It is found again in *Hexacentrus*, an allied Listrosceline. Thus, the interpretation that agrees best with our present sparse knowledge is, that *Tympanophora*, *Eomortoniellus*, and *Mortoniellus* originated from a common ancestor as follows :—



Lipotactes and *Mortoniellus* are very closely allied. *Lipotactes* is distinguished by the semicylindrical pronotum, the smooth ovipositor and the simple, cone-shaped cerci of the male. One may be inclined to consider the genus as more primitive than *Mortoniellus*, but the semicylindrical pronotum is probably a secondary character just as it is in the females of *Tympanophora*. In fact, nothing can be decided on the basis of the very scanty material hitherto known. Since *Lipotactes* is certainly closely related to *Mortoniellus*, it is advisable to attach it to this genus in a preliminary classification.

These are, in a few words, the reasons for the arrangement of genera adopted above in the descriptive part.

The Tympanophorinae resemble the Listroscelinae in many respects. This was recognised by Hebard (1922) and Karny (1931). Hebard (*loc. cit.* : 248) expressively modified the characterisation of the Listroscelinae in order to cover *Lipotactes* (and *Mortoniellus*). Karny, formerly in favour of a subfamily Tympanophorinae (1924), more recently included *Mortoniellus* with the "Hexacentrinae," a subfamily which did not appear in his earlier classifications of the Conocephaloids (1907, 1912), but which is certainly a sub-group of the Listroscelinae.

Indeed, the males of *Tympanophora* and *Hexacentrus* are very similar in their general habitus. The venation of the wings is similar, the heavy spines of the fore and middle tibiae are common to both, and even the pronotum of *Hexacentrus* is somewhat extended backwards though not elevated. Most of the differences seem to be of minor significance. However, some of the differences are common to *all* the forms here described as Tympanophorinae, and distinguish them from all true Listroscelinae so well that it is justifiable to separate the two groups.

The discriminating characters of the Tympanophorinae are : Head broad, vertex more or less swollen. Inner upper terminal spur of hind tibia missing. Hind metatarsus with one pair of small, movable plantulae, and one pair of normal pulvilli.

The Tympanophorinae in their relation to the Listroscelinae, offer a parallel to the Decticinae and Tettigoniinae. In both cases, the presence or absence of pulvilli, and the shape of the head, separate the groups. In view of the otherwise close relations of Decticinae and Tettigoniinae, Uvarov suggested that they be considered as tribes of one subfamily. Karny, in 1907, and again in 1912, suggested Conocephalinae, Copiphorinae, Salomoninae,

and LISTROSCELINAE as tribes of one subfamily. Consequently, the TYMPANOPHORINAE should form the fifth tribe of this subfamily.

Nevertheless, it seems to be wiser to use the subfamily names for the time being, as I have recently pointed out (1936). So long as the subfamilies of TETTIGONIIDAE are not completely revised, it would lead to a great confusion if some of the groups were called tribes, and others subfamilies, not because of their different systematic value, but because of the stage to which their revision has advanced.

However, the " degradation " of certain Tettigoniid subfamilies to tribes, as suggested by Karny and Uvarov, will prove to be a useful way of clearing away the many inequalities in the present system.

LITERATURE.

BRUNNER VON WATTENWYL C., 1893, Révision du système des Orthoptères, *Ann. Mus. civ. Stor. nat. Genova*, **33** : 5–230.

——, 1898, Orthopteren des Malayischen Archipels, *Abh. Senckenberg. naturf. Ges.*, **24** : 193–288.

CAUDELL, A. N., 1912, Subf. Tympanophorinae, *Gen. Insect.*, **138** : 11–12.

GERMAR, E. F., and BERENDT, G. C., 1856, *Die im Bernstein befindlichen Hemipteren und Orthopteren der Vorwelt.* Berlin.

GRIFFINI, A., 1909, Intorno a due Ortotteri saltatori raccolti a Sumatra dal Dr. W. Morton, *Wien. ent. Ztg.*, **28** : 105–109.

HEBARD, M., 1922, Studies in Malayan, Melanesian and Australian Tettigoniidae (Orthoptera), *Proc. Acad. nat. Sci. Philad.*, **74** : 121–299.

KARNY, H., 1907, Revisio Conocephalidarum, *Abh. zool.-bot. Ges. Wien*, **4** (3) : 1–114.

——, 1912, Subf. Listroscelinae, *Gen. Insect.*, **131** : 1–20.

——, 1921, Zur Systematik der orthopteroiden Insekten, I, *Treubia*, **1** : 163–269, Buitenzorg.

——, 1922, *Natur*, **14** : 10.

——, 1924, Beiträge zur Malayischen Orthopterenfauna, *Treubia*, **5** : 160–164.

——, 1931, Orthoptera Celebica Sarasiniana, I, *Treubia*, **12** (suppl.) : 1–184.

KIRBY, W. F., 1906, *Synonymic Catalogue of Orthoptera, II*, 1 (British Museum).

UVAROV, B. P., 1924, Some less known or new genera and species of the subfamilies Tettigoniinae and Decticinae, *Trans. ent. Soc. Lond.*, **1923** : 492–537.

WHITE, A., 1841, Notes on some Insects from King George's Sound, *in* Grey, G., *Journals of two expeditions of discovery in North-West and Western Australia*, London, **2** : 450.

ZEUNER, F. E., 1936, The prothoracic tracheal apparatus of Saltatoria, *Proc. R. ent. Soc. Lond.*, (A) **11** : 11–21.

——, 1936, The subfamilies of Tettigoniidae, *Proc. R. ent. Soc. Lond.*, (B) **5** : 103–109.

Explanation of Plates.

Plate 1.

Fossil Tympanophorinae.

Figs. 1–3. *Eomortoniellus handlirschi* gen. et sp. n., type, adult male. 1. Whole specimen in oblique side view. Pronotum, elytra, and middle femur are particularly well visible. 2. Left hind leg. The spines on the lower outer edge of the tibia are visible. In the lower background part of the right middle tibia with its heavy spines. 3. End of abdomen and portion of hind femur from below. Subgenital plate with styli. A bubble filled with white "emulsion" is attached to its left margin. Between the styli, the left cercus is recognisable (coming from the right in the picture), with its large inner tooth and the blunt main end the two terminal inner dentils of which are not visible.

Figs. 4–5. *Lipotactes martynovi* sp. n., type, male, last instar. 4. Whole specimen in side view. Showing head, pronotum, wing-pad, abdomen, and femora. 5. Abdomen and hind femur. The contour of the left cercus is traced in ink to show the characteristic form.

Plate 2.

Recent Tympanophorinae.

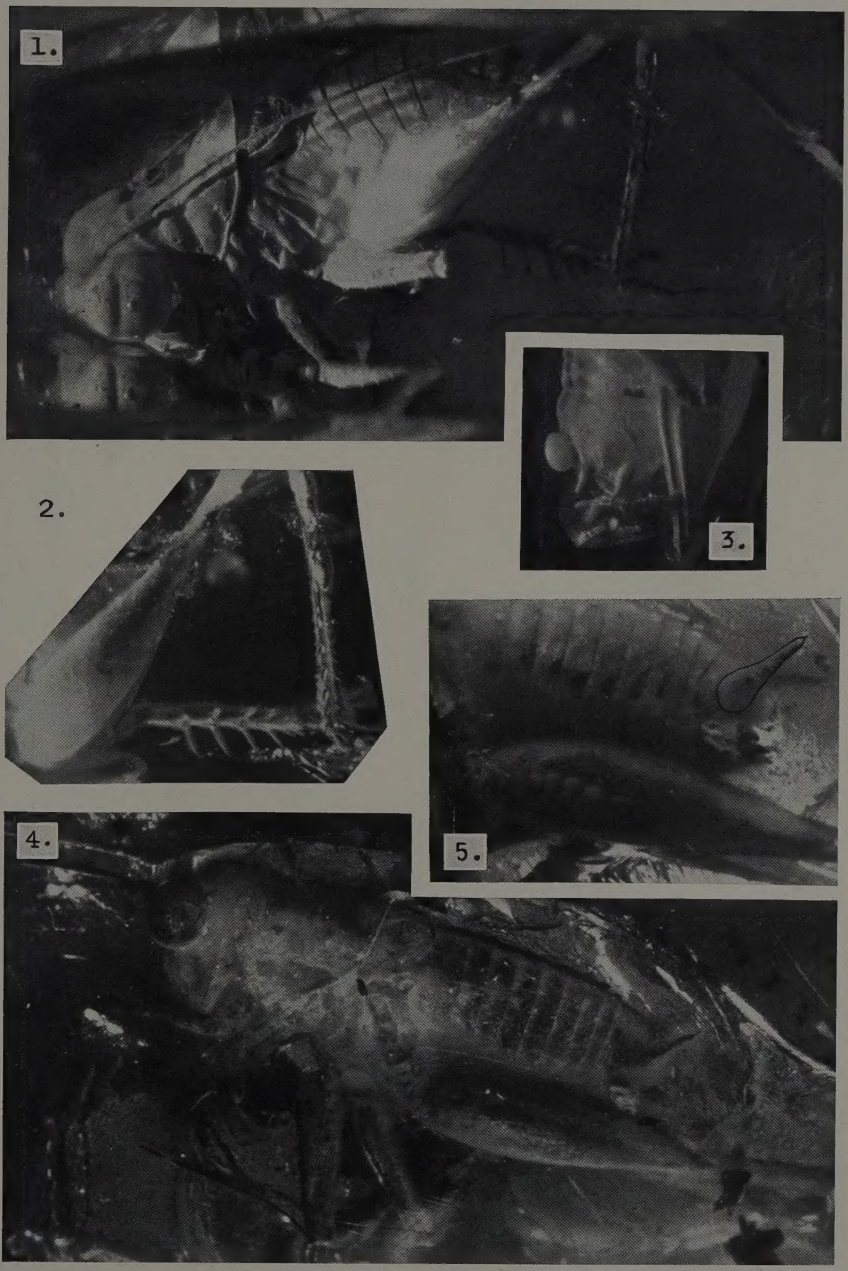
Fig. 6. *Tympanophora uvarovi* sp. n., type, male, × 1·12.

Figs. 7–8. *Tympanophora* ? *uvarovi* sp. n., female. 7, × 1·2. 8, × 1·05.

9–10. *Mortoniellus karnyi* Griff., male, plesiotype. 9, × 1·2. 10, × 1·13.

11–12. *Mortoniellus chopardi* sp. n., type, female. 11, × 1·19. .12, × 1·12.

I am much indebted to Mr. W. H. T. Tams, British Museum (Natural History), for the photographs reproduced on these two plates.



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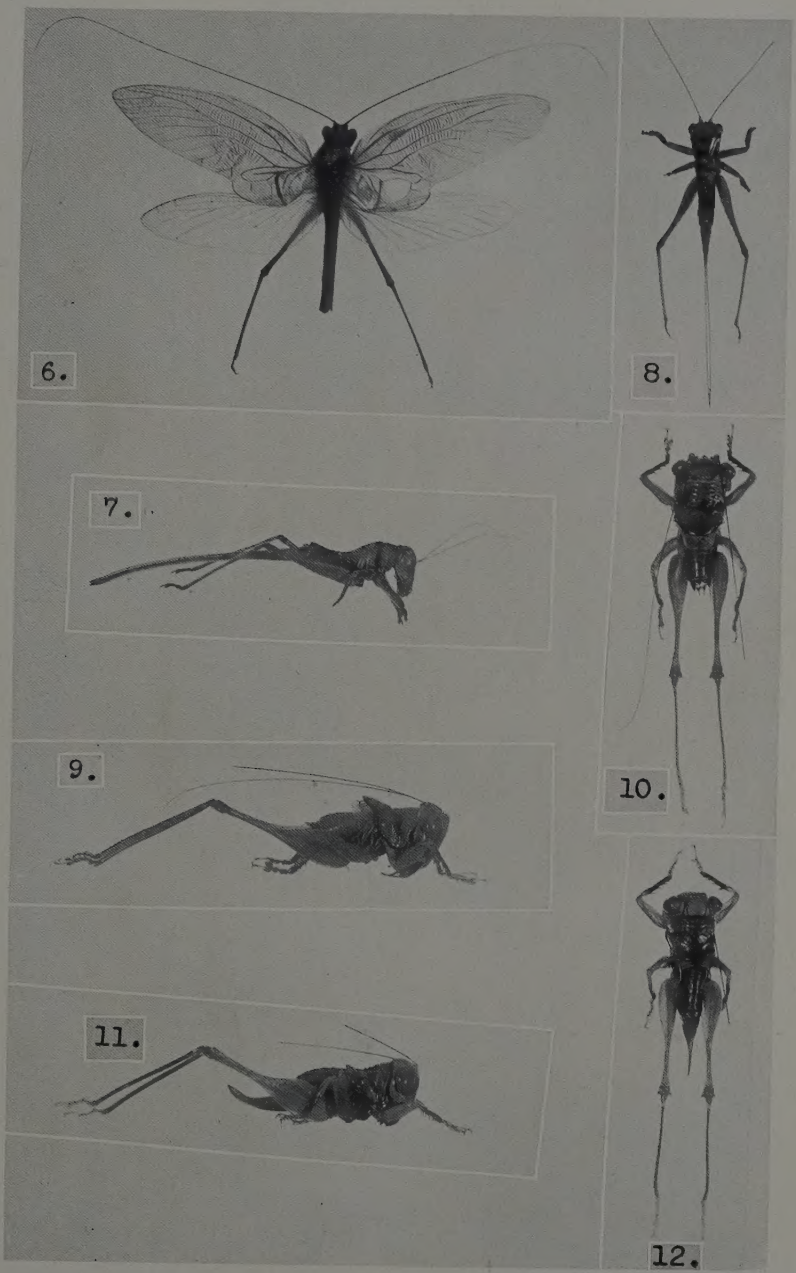
Fossil TYMPANOPHORINAE.



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Recent TYMPANOPHORINAE.